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THE 1950 OPENING OF THE BONNET CARRE SPILLWAY - ITS EFFECT ON OYSTERS

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THE 1950 OPENING OF THE BONNET CARRE SPILLWAY:

ITS EFFECT ON OYSTERS

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A SUMMARY REPORT OF MISSISSIPPI SOUND SURVEYS CONDUCTED TO DETERMINE EFFECTS OF BONNET CARRE SPILLWAY OPENING, FEBRUARY-MARCH 1950

INTRODUCTION

Studies made on the condition of oyster reefs and the waters of the west end of Mississippi Sound during the past 18 months, as well as analyses of data on the amount of water discharge from the Pearl and Mississippi Rivers during the past 10 years, demonstrated the susceptibility of this area to the danger of excessive fresh water in the past decade.[1] The discharge from the Pearl River alone during the past three out of four years has been sufficient to cause severe oyster mortalities. The unusually heavy precipitation in the Mississippi Basin during the winter months of 1949-1950 made it reasonable to assume that there would be unusually high river stages this spring. It was probable that fresh water from the Pearl River would again cause oyster mortalities and there was the strong possibility that the Bonnet Carre Spillway would have to be opened. For these reasons, I recommended to the Mississippi Seafoods Commission, while attending a meeting of that body on January 20, that they declare the oyster reefs of Mississippi, then closed, open for public fishing so that marketable oysters could be removed prior to the advent of the flood waters. This recommendation was followed only in part. The oyster reefs were opened for a few days and not many oysters were harvested. This was primarily because the oysters were not in prime condition and the fishermen were unwilling to harvest them.

On February 9, the Corps of Engineers, U. S. Army announced that the Bonnet Carre Spillway was to be opened and arrangements were made immediately with the Mississippi Seafoods Commission for the use of their boats and personnel to conduct surveys of this area.

The initial survey of the areas involved was made on February 10-11 to determine the condition of the oyster reefs and the water quality before the Mississippi River waters had time to flow into the area. On this survey it was found that the water in much of the region was already too fresh for the normal growth of oysters. A telegram was sent to the Chairman of the Mississippi Seafoods Commission on February 13 advising him of these conditions and recommending the emergency opening of the entire area for harvesting of the marketable oysters present. The Commission declared a state of emergency and opened the oyster reefs to fishing on February 15. Since that time the marketable oysters have been harvested for the most part, and the State is now engaged in an extensive program of removing the seed oysters (less than 3" in length) from these reefs to more easterly locations where they are not likely to be seriously affected by the flood waters.

1/ See also "An Investigation of Oyster Producing Areas in Louisiana and Mississippi Damaged by Flood Waters in 1945" by Dr. Philip A. Butler, Spec. Sci. Rept.: Fisheries No. 8.

SURVEYS

On the first survey trip, February 10-11, water samples were collected at 22 different stations and examined for salinity, temperature, turbidity, and weight of suspended solids in both surface and bottom samples. At 12 of these stations where oysters exist, the population was examined for quality, growth, and recent mortality. The oysters on all reefs were of fair quality, showed up to a quarter inch new shell growth but tasted "fresh." On three of the reefs there had been a recent mortality of approximately three percent. This amount of mortality is usually considered negligible. The percentage of market oysters on all reefs was very low. At this time, the oysters were showing the effects of fresh water since they tasted fresh, but the low salinity had not lasted sufficiently long to cause adverse changes.

Since February 11, four additional surveys have been made and the pertinent data with the locations of the selected stations are given on the chart. Stations 1 through 12 were selected for routine surveys because they form north-south transects perpendicular to the flow of fresh water passing through Mississippi Sound. At the present time there are no significant quantities of market oysters west of the transect formed by Stations 1 through 4. In the chart, salinity is expressed in parts per thousand. Concentrations of less than five are considered inimical to oysters. Turbidity is expressed as percentage transmission of light through the sample; high readings indicate relatively clear water, and low readings the reverse.

Surveys will be continued at regular intervals so that progressive changes in the area can be followed. Additional examinations are being made on the suspended solids and plankton content of the water in an attempt to determine their relationship to changes that are expected in the oysters.

SUMMARY

The data collected in the past month show a progressive decrease in salinity and definite but erratic increases in the amount of suspended solids or turbidity. By March 14 there had still been no significant oyster mortality.

The water in the entire area is now fresh enough to drink. Water temperatures are sufficiently high so that oysters are physiologically active. If this condition continues, we may expect a loss of the major portion of the small existing population within the next two months. In the first week of March, twenty-two days after the spillway was opened, the Mississippi River water had still not passed through Lake Pontchartrain to reach the oyster reefs in Mississippi Sound. From this fact it may be stated that the fresh water in Mississippi Sound has been derived from Lake Pontchartrain and from the Pearl River Basin and not from the Bonnet Carre Spillway. At the present time, the Bonnet Carre Spillway is being shut down and its over-flow is much less than capacity. It may be assumed, however, that the fresh water conditions in Mississippi Sound are going to continue for some weeks to come and that an adverse environment for oysters will exist there until flood stages on the Pearl River subside.

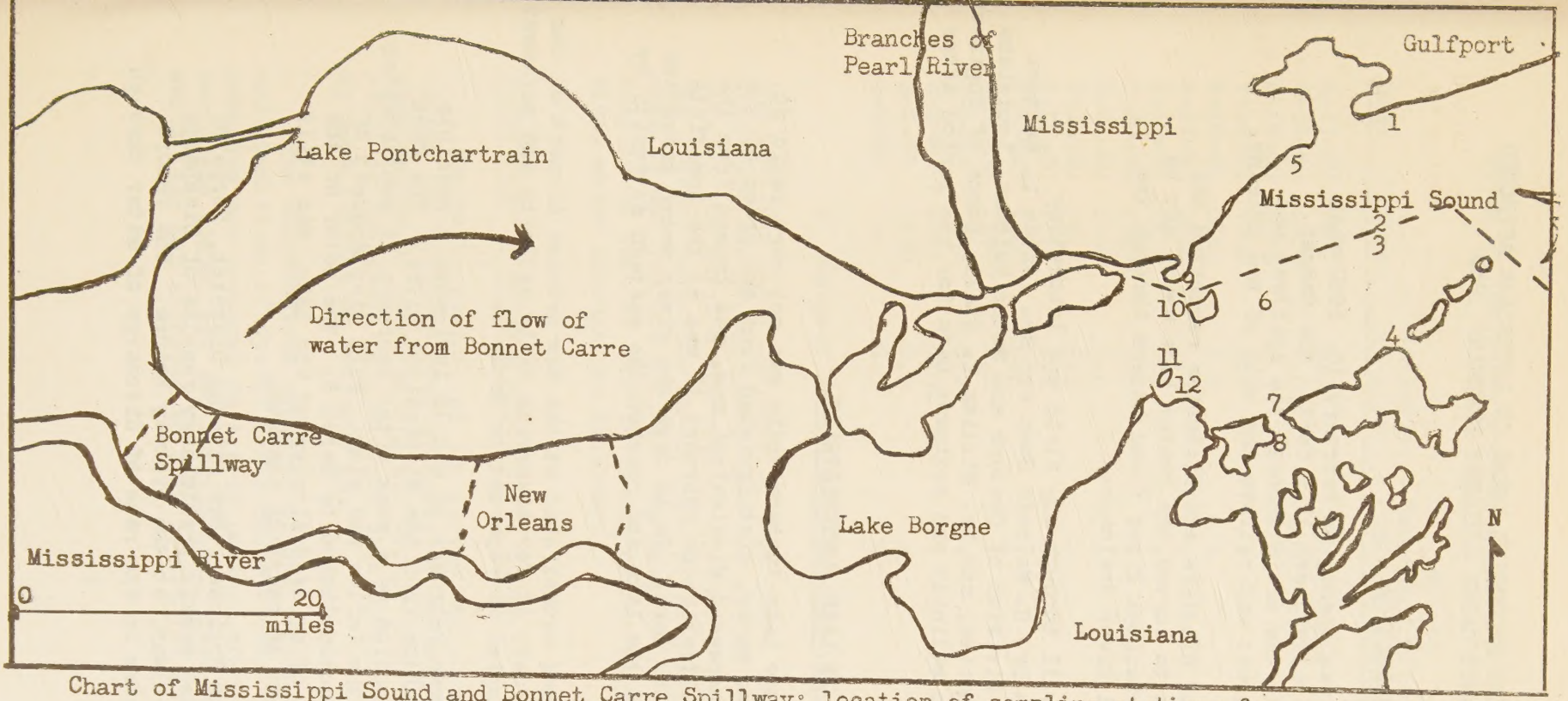

Chart of Mississippi Sound and Bonnet Carre Spillway; location of sampling stations for surveys in 1950. (Butler)

Name and Number of Station		Salinity				Turbidity			
		2-10-50	2-20-50	2-28-50	3-7-50	2-10-50	2-20-50	2-28-50	3-7-50
1	Pass Christian Reef	7.2	1.5	0.5	0.2	87.5	80	43	55
2	Pass Marianne Shoals	9.5	2.1	1.0	0.2	90	78.5	61	49
3	Cat Island Channel	17	12.3	1.3	15.3	90.5	90.5	73.5	87
4	Grand Pass	-	5.1	3.0	1.8	-	83.5	86.7	75
5	Waveland	3.2	1.3	0.6	0.4	54.5	54.5	-	46.5
6	Grand Bank	6.6	1.7	1.2	0.5	49	49.5	43	25
7	Three Mile Pass	4.3	4.0	2.7	1.8	61.3	68	80	74
8	Shell Point	-	3.3	2.85	1.9	-	65.5	50	75.7
9	Lower Point Clear	1.6	-	0.9	0.15	45	-	65.5	59.5
10	Grassy Island	3.6	1.5	1.0	0.2	48	49.5	76	36
11	Petit Pass Island	2.4	2.25	1.8	1.4	55.5	45	70.5	71
12	Petit Pass Channel	-	-	2.2	1.5	-	-	75	59

SUMMARY OF OBSERVATIONS IN OYSTER PRODUCING AREAS IN LOUISIANA AFFECTED BY THE OPENING OF THE BONNET CARRE SPILLWAY FEBRUARY 1950

INTRODUCTION

The Bonnet Carre Spillway was opened on February 10, 1950 when the stage of the River at the spillway was 19.9 feet. The danger level was listed as 20 feet, and the drain through the spillway was expected to control the flood crest and relieve the city of New Orleans.

The Louisiana Department of Wildlife and Fisheries requested the U. S. Fish and Wildlife Service to survey the oyster beds which may be affected by the outflow of Mississippi River flood waters through the Bonnet Carre Spillway and Pearl River drainage.

During the period February 11 through 23, field and laboratory work was conducted jointly with Dr. H. Malcolm Owen and Mr. Lester L. Walters of the research section of the Division of Oysters and Water Bottoms, Louisiana Department of Wildlife and Fisheries, and Mr. William E. Shell, Corps of Engineers U. S. Army. Dr. Owen furnished salinity and sediment data for the period after February 24.

CONDITIONS AT THE SPILLWAY AND IN LAKE PONTCHARTRAIN

The flow of flood water into Lake Pontchartrain was not very rapid at first. The advance of the river water, distinguished from the green of the Lake by the red color of the suspended Mississippi mud, was traced from the air. The only evidence of infiltration on February 11 was at the immediate entrance of the floodway into the Lake. In 10 days the river water traversed easterly one-half the length of the Lake and reached the eastern extremity by the end of February.

A water sampling station was established at the New Orleans Airport on the south shore of the Lake on February 11 for observing daily salinity and sediment changes. Analysis of these samples is recorded in Table 1.

The drop in salinity between February 12 and 15 indicated a possible influence of the fresh water inflow from the Mississippi River. The fact that it held constant for the period of a week after February 12 demonstrated that the Lake was fresher but the inflow was slow. Full displacement of salt lake water, however, was accomplished by March 5. The color of the water on February 20, the data of my last airview of the Lake, was still more green than red at the point of sampling station.

The office of the District Engineer, New Orleans District, Corps of Engineers, U. S. Army, furnished weekly preliminary results of Discharge Observations, Bonnet Carre Spillway, at the Highway Bridge. The record showed a slow but steady increase in the rate of discharge of water through

Table 1. Salinity and suspended slit in Lake Pontchartrain, Station A.

Date	Time	Salinity in o/oo	Weight Suspended Material 200 ml. sample	Light transmission photoelectric
2-11-50	1320	2.0	0.015 grams	92.2 percent
2-12-50	1410	2.0	0.003 "	98.1 "
2-15-50	0905	1.5	*	*
2-16-50	1700	1.5	*	*
2-17-50	0825	1.4	*	*
2-18-50	1035	1.5	*	*
2-19-50	1650	1.5	*	*
2-20-50	1325	1.5	*	*
2-21-50	1545	1.5	*	*
2-24-50	1525	1.6	*	*
2-25-50	1045	0.5	*	*
2-27-50	1415	0.6	*	*
2-28-50	1440	0.2	*	*
3-2-50	1425	0.5	*	*
3-4-50	0955	0.05	*	*
3-5-50	1530	0.0	*	*
3-6-50	--	0.0	*	*

* Analysis of sediment samples incomplete at this time.

the Spillway since its opening this year. On February 11 at noon the discharge was 57,000 cubic feet per second and by March 4 it was 223,000 c.f.s. On March 5 the rate of discharge cut back to 215,000 c.f.s. The gradual reduction in the rate of discharge continued through March 12 when it was 180,000 c.f.s. The pattern of the 1950 discharge is somewhat similar to that of 1937 in timing and in magnitude of the rate of Mississippi River water through the Spillway.

CONDITIONS IN WESTERN MISSISSIPPI SOUND

The major purpose of the survey was to observe conditions in and around the oyster producing areas of western Mississippi Sound. The examination of these waters and oyster beds began February 11 and is still in progress. My personal observations ended when I returned to my home station on February 24.

The observations centered on salinities, suspended silt, temperatures and conditions of oyster reefs and oysters. Salinity and suspended silt sampling was arranged in a grid pattern composed of three transects running north and south, and two longitudinal lines of stations running east and west. See map attached to this report for station locations.

All salinities in the area showed a considerable reduction since February 11. At most stations the drop was drastic shortly after the start of the survey. The source of fresh water responsible for the lowered salinities during the first drop was undoubtedly the Pearl River outflow since the salinity in Lake Pontchartrain was not materially reduced at this time. The influence of the drainage from Lake Pontchartrain into Mississippi Sound, however, may be partly concerned with the salinity reduction after February 28. The salinity changes are shown in the following tables.

Table 2. Transect I, Bottom salinities o/oo, Mississippi Sound

Date	Stations C	D	E	F 1/
2-11-50	2.7	6.1	9.4	9.0
2-12-50	2.9	4.4	-	9.6
2-15-50	2.3	1.5	1.7	9.0
2-17-50	1.3	1.7	2.9	2.0
2-20-50	0.9	0.9	1.9	3.6
2-22-50	0.6	0.9	1.8	2.4
2-23-50	0.6	1.1	1.4	3.4
2-25-50	1.5	0.8	2.0	2.9
2-28-50	1.4	1.1	1.4	3.2
3-2-50	0.4	0.7	1.1	3.1
3-11-50	-	-	-	0.3

Table 3. Transect II

Date	Stations G	H	J	K 1/
2-11-50	1.8	-	-	3.5
2-12-50	3.2	5.2	4.0	6.5
2-15-50	2.0	-	-	-
2-23-50	1.4	1.6	2.0	3.0

1/. The stations are arranged from north to south.

Table 4. Transect III.

Date	Stations L	M	N	P 1/
2-12-50	-	-	11.9	15.1
2-15-50	-	-	2.9	3.7
2-16-50	2.4	-	-	-
2-18-50	1.8	-	-	-
2-20-50	1.7	-	-	-
2-22-50	1.7	-	-	-
2-23-50	-	-	9.2	2.7
2-24-50	1.8	-	-	-
2-25-50	-	1.0	2.1	3.6
2-26-50	2.5	-	-	-
2-28-50	1.0	1.0	2.0	3.2
3-2-50	1.2	-	-	1.9
3-4-50	1.1	-	-	-
3-6-50	0.8	0.5	0.7	1.9
3-9-50	1.0	0.2	0.3	1.1
3-11-50	0.3	0.3	1.2	1.1

Table 5. Longitudinal Run IV, Bottom salinities o/oo

Date	Stations Q	R	S	G	T	D	U	N 1/
2-11-50	1.0	0.8	1.1	1.8	2.4	6.1	-	-
2-12-50	-	-	1.0	3.2	3.2	4.4	10.4	11.9
2-15-50	-	-	1.9	2.0	1.9	1.7	2.2	2.9
2-23-50	-	-	-	1.4	1.5	1.1	6.9	9.2
2-25-50	-	-	-	-	-	0.8	-	-
2-28-50	-	-	-	-	-	1.1	1.2	2.0
3-2-50	-	-	-	-	-	0.7	-	-
3-6-50	-	-	-	-	-	-	0.4	0.7
3-9-50	-	-	-	-	-	-	0.2	1.9
3-11-50	0.3	0.3	0.1	-	-	-	-	1.2

Table 6. Longitudinal Run V.

Date	Stations Q	V	W	X	K	Y	Z	F	P 1/
2-11-50	1.0	0.9	0.9	2.9	3.5	6.0	6.5	9.0	-
2-12-50	-	-	-	-	6.5	14.9	11.6	9.6	15.1
2-16-50	-	-	-	-	-	-	-	9.0	3.7
2-23-50	-	-	-	-	3.0	3.4	3.3	3.4	2.7
2-25-50	-	-	-	-	-	-	-	2.9	-
2-28-50	-	-	-	-	-	-	-	3.2	3.2
3-2-50	-	-	-	-	-	-	-	3.1	1.9
3-6-50	-	-	-	-	-	-	-	-	1.9
3-9-50	-	-	-	-	-	-	-	-	1.1
3-11-50	0.3	0.3	0.3	1.3	-	0.4	-	0.7	1.1

1/. The stations are arranged from west to east.

The waters of the western Mississippi Sound are usually turbid. The degree of turbidity depends on wind effects in creating turbulence on the bottom and/or the silt load in the waters brought into the area during flood stages of the rivers. Turbid conditions were present during most of the period of our observations, February 11 through 23. Most of this time the turbulence of the water from the high winds roiled the bottom and put into temporary suspension the loose silt usually present in the area. This occurs many times throughout the year and the extent of its deleteriousness on oysters is debatable. Heavy silting, however, may be dangerous to oyster populations.

Some silt was furnished by the influx of the Pearl River flood waters, but this influence was limited to the area not greatly removed from the mouth of that River. The silting pattern from the Pearl River was observed from the air and its limits were well defined. The margin of this silt line extended or contracted according to the direction of the winds. Winds from the north pushed the silt-laden river water southerly as far as Grand Island. Winds from the south restricted the silted waters to the immediate area around the mouth of the River. The silt load contributed by the Pearl River at this time did not seem excessive.

The drainage of Lake Pontchartrain through the Rigolets into western Mississippi Sound was not carrying silt at the time of these observations. The silt from the Mississippi River entering Lake Pontchartrain through Bonnet Carre Spillway was still contained within the Lake. This situation may easily change if westerly winds and flow through the Spillway is prolonged. Mississippi River silt came into Mississippi Sound in quantity in 1945 by this route as recorded by competent observers at the time. The slow movement of the silt-laden water at present presages little cause for alarm from this source unless more drastic flood conditions on the Mississippi River develop.

The condition of oysters and the oyster bottoms both natural and planted likely to be damaged was examined during this survey to serve as a base line for determining future changes. The sampling covered the area that received damage during 1945. Oyster mortalities were generally low (Table 7). At Grand Island, Station M-7, the boxes of recently dead oysters and the number of bright scars represented about a 30 percent mortality. The proximity of this oyster ground to the mouth of Pearl River, a source of fresh water, may account for most of this loss. This bed would also be in the path of fresh water and silt from the outflow of Lake Pontchartrain. The living oysters at this station were in fairly good condition as they were at all other stations examined.

Table 7. Percent Mortality of Oysters, Western Mississippi Sound

Location	Station No.	Date	% Mortality	Remarks
West of Grand Island	M-7	2-23-50	15.4	Natural Reef; Bright scars show additional 15%.
Grand Banks E. of Grand I.	M-4	2-15-50	3.6	(Natural Reef;
ditto	M-8	2-23-50	6.3	(Oysters mostly seed size (and slow growing
West of Three Mile Pass	M-1	2-15-50	24.6	Shell planting 1948; stiff mud, soft bottom sloughs
East of three Mile Pass	M-2	2-15-50	12.1	Shell planting 1948; stiff mud and shell gravel
Mouth of Turkey Bayou	M-5	2-15-50	7.5	Shell planting 1949; stiff mud and shell bottom
West side Turkey Bayou	M-3	2-15-50	16.0	Seed planting 1949; stiff mud and shell bottom
Inside Grand Pass	M-6	2-15-50	6.1	Natural Reef; hard shell bottom

The oyster grounds were not silted to a noticeable extent. Therefore, unless considerably more silt infiltrates the area, mudding damage should not occur.

The present low level of salinity over most of the area does represent a potential danger to the oyster population. At the same time the recovery of these waters from the low salinity condition is rapid when the prevailing winds are southerly and the rivers cease their flooding.

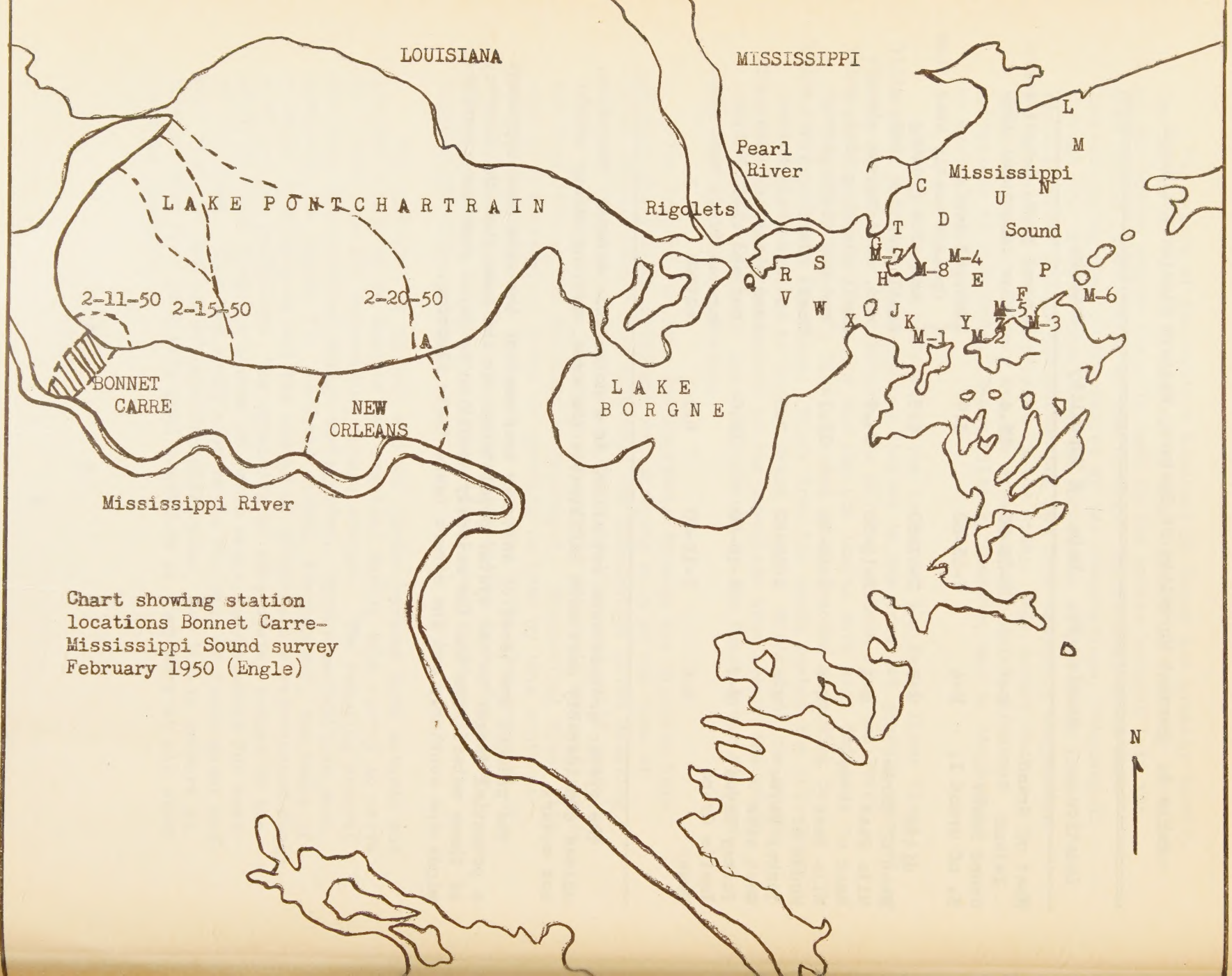

Chart showing station locations Bonnet Carre-Mississippi Sound survey February 1950 (Engle)